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NOTES ON SPECIES RELATIONS IN INFESTED PONDEROSA PINES, PROJECT IIb.

Modoc National Forest, 1938 Season

Methods

During the period October 11-26 inclusive, a total of 110 insect killed trees (chiefly 1938 winter brood kills) were felled and analyzed in Badger Township on the Modoc National Forest. For the most part, selected trees were within five chains of a road. The roads covered are shown on the accompanying map. The area covered was approximately the same as in 1937. Between the south township line and Badger Well the trees selected were those whose fades were visible from the road, or trees adjacent to such fades. For the area covered north of Badger Well, a five chain strip was cruised on either side of the road to locate 1938 winter kills. Hence it is probable that the distribution of trees in the latter area, as shown in the map, is more accurate than in the former area. No trees were taken in Regional Survey plot 5. A few comparisons of numbers of trees found in 1937 and 1938 along certain strips of road are given below:

Strip	No. 1937 trees	No. 1938 trees
South township line to Badger Well	21	21
Lone Pine Butte Road *	10	16
RS-5 to Dalton Reservoir Road	3	10
Dalton Reservoir Road	30	25
Dalton Reservoir Road to east township road	12	21
East township line	8	3

* Not wholly comparable.

Type of Infestation

The chief characteristic of note concerning the distribution of the 1938 trees was the grouping tendency, particularly noticeable when contrasted with the 1937 situation. In that year 12 percent of the trees occurred in groups, while 44 percent of the 1938 trees were grouped. In 103 winter brood trees, 12 of the 17 groups consisted of two trees each. There were two groups of three trees each, and one each of four, five and six trees. In the case of the five and six tree groups, the radius of the group was approximately one half chain. In all other groups the radius was less than 15 feet.

In connection with the groups it was found that 12 out of 17 groups had a distinct "key" tree in which brood stages were sufficiently advanced to indicate that the attack had not occurred simultaneously on all trees of the group.

In locating analysis trees note was made of the nearest winter and summer brood trees. For reference purposes these notes are appended. In summary, 30 percent of the selected trees had another winter brood tree within 10 feet, while 46 had one within one chain. The corresponding percentages for nearest summer brood trees were 12 and 17 respectively. At the other extreme, 24 percent of the trees had no winter brood tree within five chains and 47 percent had no summer brood tree within the same distance. Two of the 17 groups included a summer brood tree within the group, while in 7 cases a winter and a summer tree formed a group.

Notes on the Several Insect Species

Dendroctonus brevicomis was characterized by heavy broods with but few unsuccessful attacks. In 38 percent of the trees, D.b. was found alone. Some of these trees had been topkilled. In another 13 percent there had been an Ips oregoni fill-in above D.b., making a total of 52 percent in which D.b. was the chief insect in the dead or dying tree. In contrast to this figure, the 1937 analyses showed but 7 percent of the trees in which D.b. was the insect chiefly concerned. The decided upswing in the predominance of this species is to be expected in connection with the grouping.

Dendroctonus monticolae decreased significantly in importance as compared with the previous year. A considerable number of light or poor broods of this species were found, but no trees were analyzed which contained pure D.m. broods even in portions of the bole. In 1937, D.m. was commonly found successful. At least in the area examined, this species played a decidedly minor role in the 1938 winter brood infestations.

Dendroctonus valens also occupied a less prominent position than in 1937 when the species was commonly found in heavy broods extending to a height of 6 to 10 feet above the base of a tree. The current examination revealed numerous unsuccessful attacks, while successful broods, found in a few trees,were limited to the basal two or three feet.

Ips oregoni occupied a prominent position, particularly as a fill-in species in trees initially attacked by the western pine beetle. Broods were heavy, and in a majority of cases, emergence was largely completed by the time of examination. Several cases were noted where there had apparently been a 1938 summer topkill by this species. This insect was considerably more abundant than during the previous year, a fact which may be partially accounted for by the abundance of windfalls of early 1938 which furnished breeding material and from which heavy emergence occurred. Parent adults of Ips oregoni were observed cleaning out D.b. galleries in trees where the D.b. brood was well advanced. Possibly many of these adults will overwinter in the tree.

Ips emarginatus was rare, no broods being found. A few scattered parent adults were found cleaning out D.b. galleries preparatory to overwintering.

Melanophila californica. In 1937 this species was found in some stage in 61 percent of the trees. In 90 percent of these, prepupal or nearly prepupal larvae were found. In many cases whole sections of bark were found to contain pure flathead brood. In contrast to this condition, the 1938 analyses showed M. Californica occurring in only 41 percent of the trees, and of these only 45 percent had prepupal brood. The reduction of the percent of trees in which flatheads were found would be expected with the occurrence of groups and the upswing of D.b., but that prepupal brood occurred no less frequently must be otherwise explained. In many cases larvae were found in the fast growing stage or in the larger stage where they begin to work outward into the bark. It may be assumed that development during the summer of 1938 was slowed and larvae failed to complete development to the prepupal stage as has been observed to normally occur. Possible this phenomenon is due to the relatively late, wet spring and to a period of cool, wet weather during the first part of July, at which time most rapid development would normally be undergone.

Melanophila gentilis is not considered an important factor in the death of standing trees not otherwise injured. In 1937, however, several trees were examined in which it was suspected that the flathead brood was of this species. In one case an entire tree was infested by this species, as was proven by 1938 bark rearings. This year's analyses record several cases where a few larvae were suspected of being M. gentilis, but no significant brood was noted.

Roundheads were found in abundance, being particularly heavy in otherwise pure D.b. infestations.

Relations of 1938 Winter Brood Trees and Previous Topkills

Of 103 winter brood trees felled, 42 percent were found to have been previously topkilled - that is prior to the 1938 season. This compares with 37 percent in 1937. Flatheads were recorded as being the species responsible for the topkill in many cases, particularly for the older kills. Several cases were indicated as possibilities of the topkill having resulted from the 1937 low temperature period, with no other emergence holes than those of roundhead borers.

Summer Brood Trees

Seven additional trees of the 1938 summer brood were felled. Of these, one had been infested by D.m. and Ips, while the other six

were either pure D.b. or D.b.-Ips trees. In two cases there had been previous topkills. Although based on a few trees, the indication is given that the D.b. upswing had begun with the 1938 summer brood.

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